

Science Lessons for Several Grade Levels (3-5, 6-8, 9-12)

“Understanding and Interpreting Electrocardiograms”

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Discipline: Biology, Physiology

Grade: 6 to 8, 9 to 10, 11 to 12

Standards

NAS Science Standards: Abilities necessary to do scientific inquiry / Structure and function in living systems / The cell

NCTM: work flexibly with fractions, decimals, and percents to solve problems / develop a deeper understanding of very large and very small numbers and of various representations of them

ITEA: Medical Technologies

Purpose/Goals

Students should understand the connection between heart contraction and electricity.

Students should be able to interpret an electrocardiogram.

Students will design an experiment to test how an activity affects heart rate.

Students should be able to predict how other activities will affect heart rate.

Context

Misconceptions: the heart requires some connection to the brain in order to function.

Pre-requisites: very basic understanding of cells

Series: This lesson can be used in conjunction with other lessons that investigate oxygen consumption dynamics during exercise.

Preparation

Equipment for measuring electrocardiograms.

Motivation

Present some animals students may be familiar with, ask them to predict the heart rates of the animals. Ask student about what causes a heart contraction / similarities to skeletal muscle contractions.

Description

In this activity students will learn about the electrical basis for heart contraction. Following a brief introduction to heart anatomy and the generation of action potentials within the heart, students will measure and interpret their own electrocardiograms. Students will then design a small experiment to test the affect that an activity will have on their electrocardiogram and heart rate.

Assessment

Students can construct concept maps for hearts and electrocardiograms in addition to graphing and sharing the results of their experiment with the rest of the class.

Follow-Up Activities

Further areas for exploration include cardiac regulation in other animals and the link between heart rate and oxygen consumption. This lesson provides a great opportunity to introduce multi-entrance, multi-exit problems that really allow students to show what they've learned. I find optimization problems to be a good base, since they provide a quantifiable function the students can try to optimize. I stress that improved critical thinking and problem solving are the goals, not necessarily the answer.